Remarks:

Claims 1-65 were pending in this application at the time of the first Office Action. By this amendment, claims 1, 20, and 33 have been cancelled. Claims 2, 21, and 35 have been substantially rewritten into independent form. Claims 22 and 25 have been amended to remove the "instantly" limitation for the threshold adjustment. Claim 35 has been amended to change its dependency from cancelled claim 33 to amended claim 35. Claim 66 has been added. No new matter is present.

Support for the addition of the "instantaneous sound level" limitations in amended claims 2, 8, 10, 16, 21, 26, 28, 29, 35, 41, 43, 55, and 56 can be found throughout the application. For example, Figures 12-16 depict the gain characteristic as a function of instantaneous input. (See also, Application; page 26, lines 12-26.) Furthermore, support for the "decompression" limitation of amended claims 8, 16, 26, 28, and 41 can be found in the application at page 36, line 27-30. Amendments to claims 42 and 44 are similarly supported. Support for the BPNL limitation (BPNL being a well understood term of art) of amended claims 2, 13, 35, 45, 60, and 63-65 can be found throughout the application (see, for example, Figure 1). Support for the subband limitations of many of the amended claims can also be found throughout the application (see, for example, Figure 1). Further, support for the "in time" limitation of claims 36 and 37 can be found throughout the application (see, for example, page 44, line 10 through page 47, line 5).

Also, Applicant reserves the right to pursue the subject matter of the cancelled claims through a continuation application. Therefore, the currently pending claims of the application are now 2-19, 21-32, and 34-66.

Also, Applicant notes that in the published version of this application there is a discrepancy in that the USPTO publication (2002/0057808) lists claim 9 as depending from claim 3. The application in fact lists claim 9 as depending from claim 8. Applicant respectfully requests the Examiner to check the USPTO records for this application to verify that claim 9 is properly listed as being dependent from claim 8.

By this amendment, all independent claims recite that the compressive gain provided the invention is instantaneous compressive gain. Applicant has defined "instantaneous" in the specification in the following manner:

> When the compressive gain is said to be instantaneous, what is meant is that the input/output relationship is number in/number out; essentially, the compression is memoryless in that the output does not depend upon previous inputs. (See Application; page 9, lines 8-12).

Having provided a clear definition for the term instantaneous in the specification, the claims are to be examined with that meaning. See MPEP 2111.01; In re Zletz, 13 USPQ2d 1320 (Fed. Cir. 1990); and In re Glaug, 62 USPQ2d 1151 (Fed. Cir. 2002).

Before specifically addressing the Office Action's claim rejections, Applicant will explain a distinguishing feature of the claimed invention relative to conventional gain compression used in the art. Conventional gain compression, as exemplified by the cited references, does not teach the use of instantaneous gain compression, and in fact, teaches away from it by diametrically opposing its use. As noted in the background section of the application at page 2, line 32 through page 3, line 16, conventional wisdom teaches away from instantaneous compression because of the signal distortion that is produced by instantaneous compression. To avoid the distortion produced by fast-acting compressive gain and to avoid the loudness discomfort produced by slow-acting compressive gain reduction, the conventional art teaches the use of "time constants" or "attack" times that balance between these objectives in providing compressive gain. Conventional art must also solve conflicting time constant requirements for gain increases (or "release" times) when the received signal level decreases. To provide greater amplification for consonants than for vowels in normal connected speech, relatively fast syllabic release times are needed. However, longer time constants are needed to avoid emphasizing the background sounds during normal pauses in speech. These time constants and attack/release times are inherently non-instantaneous. Typically, these conventional techniques require many samples of the incoming sound signal to be processed before providing gain compression.

Rather than follow the conventional approach to gain compression, Applicant has proceeded contrary to conventional wisdom to provide instantaneous gain compression. By providing gain compression instantaneously, users of the present invention avoid unnecessary overamplification of sudden loud sounds that could cause them discomfort. With conventional non-instantaneous gain compression, there will be a delay (the "attack time") that may allow sudden loud sounds to be unnecessarily and uncomfortably overamplified. Moreover, because gain compression for increasing sounds levels is assured by the claimed invention without the

need to adapt the hearing aid, temporary losses in sensitivity following intense transient noises are also avoided.

To regulate the distortion produced by the instantaneous compressive gain, the claimed invention provides control over that distortion through intelligent adaptive control of the compression threshold. Figures 8 and 9 exemplify distortion that can be produced by instantaneous waveform compression (namely, in the example of Figures 8 and 9, reductions in contrast and peak factor). Figure 1 also illustrates these distortions and further illustrates how adaptive control of the compression threshold can intelligently control the distortion in a beneficial manner. Instantaneous compressive gain results in weaker portions of a sound signal receiving greater amplification than stronger portions of the sound signal. In a quiet environment, such as that depicted in charts 140, 142, and 144 of Figure 1, the instantaneous waveform compression may be beneficial for a user because normally weaker consonants will be enhanced relative to adjacent vowels, thereby improving intelligibility. Contrarily, in noisy environments, such as that depicted in charts 150, 152, and 154 of Figure 1, the waveform compression may result in the noise becoming too strong (see chart 152 of Figure 3), thereby resulting in a loss of intelligibility. However, through adaptation of the compression threshold as taught by the invention, the impact of this distortion can be controlled to improve intelligibility (see chart 154 of Figure 2).

As will now be explained, the cited references teach the use of conventional ***non-instantaneous*** gain compression, and as such, fail to render a technique combining instantaneous gain compression with an adaptive compression threshold unpatentable.

I. The Cummins reference fails to anticipate claims 2, 21, 35, 55, 56, 60, 63, and 64 and fails to render claim 65 obvious because the Cummins patent fails to disclose, teach, or suggest the use of instantaneous compressive gain.

The Office Action asserts that the Cummins patent discloses instantaneous compressive gain. Applicant respectfully disagrees. Figure 4 of Cummins illustrates that the gain is not instantaneous but rather delayed by a "delay time τ". This delay occurs because the Cummins compressive gain is dependent upon several samples of the incoming sound signal being processed. (See Cummins, col. 8, lines 40-56; see also col. 7, lines 43-66 ("Because of the delays required to perform the magnitude envelope calculation and to compute the gains, a

gain is computed for a sample taken at a time several microseconds (or clock periods) earlier and the input signal X(T) is delayed by the time period delay...")).

In fact, Cummins expressly describes the use of attack times and release times in accordance with conventional gain compression. (See Cummins; col. 5, lines 32-35). According to Cummins:

> The time constants of the non-linear amplifier over which the gain remains substantially unchanged is an important characteristic which affects its performance. The longer the time constant, the less compression of short term waveform changes is achieved. ***However, the shorter the time constant, the more distortion is introduced for a given expansion or compression ratio. In the system of the present invention, a time constant value of about 1 to 2 milliseconds provides preferred performance***. (See Cummins; col. 3, lines 18-28 (emphasis added)).

Therefore, it is clear that Cummins does not teach instantaneous gain compression and instead teaches that there should be a delay in providing compressive gain.

In view of the failure by the Cummins reference to disclose the instantaneous compression limitations of claims 2, 21, 35, 55, 56, 60, 63, and 64, Applicant asserts that the rejection of these claims (and all claims depending therefrom) is improper, and respectfully requests withdrawal of the rejection.

II. The Armstrong reference fails to anticipate claims 2, 21, and 56 because the Armstrong patent also fails to disclose, teach, or suggest the use of instantaneous compressive gain.

Like the Cummins reference, the Armstrong reference fails to disclose, teach, or suggest the use of instantaneous gain compression. In Armstrong, the compressive gain is dependent upon time averaging functions performed by various circuitry components. As such, the compressive gain is not instantaneous due to the delays inherent in time averaging. More specifically, Armstrong teaches that the gain of operational amplifier 160 of Figure 9 is determined by a current-controlled feedback resistor, wherein the control currents are rectified and time-averaged functions of the output signal. (See Armstrong; col. 5, lines 32-43; col. 8, lines 26-41).

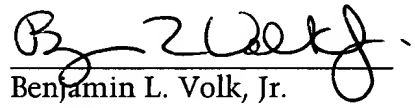
Therefore, because the Armstrong reference fails to disclose, teach, or suggest the use of instantaneous gain compression, Applicant respectfully submits that the rejections of claims 2,

21, and 56 (and all claims depending therefrom) lack merit and should be withdrawn for the same reasons expressed above in connection with the Cummins reference.

Conclusion:

Because the cited references fail to disclose, teach, or suggest the claim limitations relating to instantaneous gain compression, Applicant respectfully submits that the amended claims are patentable. Favorable action is respectfully requested.

Respectfully submitted,



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